# USERS' REACTION TO THREE PERSONAL COMPUTERS

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To make a campus-wide network recommendation on three specific computers, an experimental scheme was developed to evaluate the strengths and weaknesses of each.

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Most of what we read about new personal computers is written by hobbyists, experts. or the public relations department of the machines' vendors. But what do the users really think about these machines? How would they compare the Apple Lisa or Macintosh with the IBM-PC. Do types of users differ? For example, does a secretary have a different perception than a physician or professor using the same word processor?

To answer these questions, we introduced three kinds of microcomputers into the offices of engineering professors at Purdue University, as part of an effort to develop a campus-wide network.

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Some machines were used by professors. and some by their secretaries; some users were given Macintoshes or Lisas, and some IBM XTs. We followed the use of these micros for three months, staying in contact with the users and analyzing the problems they encountered. At the end of this period, all users completed a questionnaire. We found many important, unexpected differences among their responses, depending on the kind of user and the machine being used. We will summarize our findings here, in the hope that they may help you choose an appropriate computers and introduce it effectively in your office practice.

The IBM-XTs that were used in the study each had 256K of memory, with 10-megabyte hard disk, 360-kilobyte floppy disk, and color monitor. The software for the XT was Microsoft's word processing program WORD, which in some ways resembles the word processors on the Apple (it uses a mouse, provides windows, and can display more than one font at a time, such as italics and boldface). The Apple Lisa was provided with 512 Kbytes of internal memory and 5 million bytes of hard disk memory. The Macintosh came with 128 Kbytes of memory and one 400-kilobyte floppy disk. Users of both Apples were provided only with the Apple drawing and word processing programs (MacWrite and MacDraw).

There are important differences in design philosophy software availability, and hardware capability among the computers used in this study. Of the three personal computers; the IBM-PC is the oldest and has the largest share of the market (28%). It was designed with a conventional command-oriented operating system similar to CP/M-the 8-bit (operating. system "standard." The machine has an open architecture that is, IBM made the specifications of the computer available to independent vendors to enable them to offer hardware and software for this computer and its clones. Because of the length of time it has been on the market and tie success it has achieved, the XT accommodates a wide range of software.

Apple's Lisa and Macintosh both follow the same design philosophy. Their operating System is a radical departure from the past. Most of the design innovations were borrowed from a Xerox computer called STAR, which us ad the desktop as its metaphor and employed icons to indicate various tasks. A "mouse" moves a pointer in any direction on a screen [see. Clement J. McDonald, "Judging Office Practice Systems:

Accessing. Data Entry Methods," in the premier issue of M.D. COMPUTING (1983)]; with the mouse, you can expand windows on the screen, or pull down menus and choose among the options they offer. Both machines have a high-resolution, screen, which permits multiple fonts and the creation of very sophisticated figures and drawings. Their printer can copy screen graphics and text verbatim.

The Lisa uses a 12-inch monitor; it is sized very much like the IBM-PC and other personal computers, and has a large keyboard with function keys. The Macintosh is much smaller, with a 9-inch screen, only 58 keys on the keyboard, and no function keys. The IBM-XT is an appropriately sized machine for many office functions. The Apple Macintosh, with only one floppy disk and 128Kbytes of memory, is not.

Because of the small amount of internal main-memory and the single floppy drive, movement of data can be very time consuming. (One user has related that it took him 50 disk swaps and 20 minutes to transfer 270K bytes of data-a horrible experience.) Moreover, though the Macintosh has marvelous window and pop-down menus, these facilities could not be accessed by the programs written in Macintosh Basic [1]. Thus, the most powerful features were not directly available to the user who wanted to write his own programs.

The memory limitations have since e been eliminated. The new Macintosh provides 512K bytes of memory; and we hope that by the time this article is published the problems with the hard-disk versions will have been resolved.

The Lisa is a larger machine, uses the original Lisa operating system, which had a reputation for slowness and various glitches. The impression of Lisa users, however, may be indicative of what people would think of a larger Macintosh.

## METHOD

Of the twelve secretaries who participated, half were given the Apple Lisa 2/5 and the other half the IBM-XT. Among the fifteen faculty members, nine were given the Macintosh (the 128K version) and the other six the IBM-XT.

Users were invited to tutorials by local computer vendors before they began to use the systems. IBM users were offered three half-day sessions, Lisa and Macintosh users one three-hour sessions. Only faculty members had the Macintosh, and, as it turned out, they did not attend the Macintosh tutorials. From the initial questionnaire, we found that all participants were familiar with computers. and that both secretaries and professors used large interactive computers daily or weekly. All had favorable attitudes toward computers; that is, they liked computers and considered them the fastest means of getting some tasks done. In the second questionnaire, filled out at the end of the three months, we posed our questions in terms of statements with which the users were asked to agree or used it before, looks similar to the disagree. We used a five-point scale: respondents could indicate that they disagreed, or strongly disagreed, were neutral, agreed, or strongly agreed with the statement. The information gathered was broken into two tables, the first dealing with the differences among computers (Table 1) and the second dealing with differences between secretaries'-and professors' opinions (Table 2).

## DIFFERENCES AMONG COMPUTERS

The six statements on our questionnaire that distinguished among computers were:

1. The computer is not powerful enough.

2. The computer seems like a sophisticated toy.

3. 1 have all the software that is needed.

4. The screen is easy to read. Word processing is fun.

6. It is easy to remember what each command does.

The distribution of these responses is charted in Table 1, and their significance is worth exploring:

1. The computer is not powerful enough. This response came from Macintosh users more frequently than from either IBM, or Lisa users. The Macintosh machines tested had only 128K bytes of memory, which represents one half the memory available to the IBM and one-quarter of the memory of a Lisa computer. The

limitations of the Macintosh memory were aggravated further by the large amount of memory consumed by the operating system; when you use the BASIC program that comes with the system, only 13K bytes of memory are left for data. The response to this question indicates that users rapidly become aware of this limitation.

2. The computer seems like a sophisticated toy. Again, the Macintosh users agreed with this statement more often than the IBM or Lisa users did. The reasons for this could be related to the limitations mentioned above. Another possibility is that the Macintosh does look more like a toy. It is much smaller than the others (with only a nine-inch screen), and the mouse, for those who have not larger; and perhaps took more like the way computers "should" look.

3. I have all the software that is needed. Again, the Macintosh fared, worse than the other two computers, with all Macintosh users concluding that more software was needed. This could be an unfair criticism of the Macintosh. however, because the machine was so new when the study was carried out; software is always limited on new machines. This objection should be taken, instead, as a general criticism of computers that are marketed before much software is available. It helps to highlight the importance of IBM's, decision to open up the specifications of the PC for anyone who wanted to develop software for it, thus increasing software availability.

4. The screen is easy to read. One of the main criticisms people-had to make about the IBM was that the screen is hard to read. The users seemed to prefer the high-resolution screen on the two Apple computers, The Apples also differ from the IBM in that they display dark letters on a light screen, thus imitating the look of newspapers, books, and magazines. The IBM uses the traditional white-on-black screen.

As we mentioned above, we used a color monitor for the IBM machines in this study. Most color monitors produce much fuzzier lettering than monochrome monitors do, and we doubt that the respondents would have had the same reaction if we had provided them with the monochrome variety. Because a monochrome monitor is less expensive and its display is more legible for word processing, we generally do suggest buying monochrome instead of color; though color is attractive, it is more of a frill, and sometimes detrimental. Perhaps the Apple strategy of providing only monochrome was not a bad decision after all.

5. Word processing is fun. Users generally agreed that word processing is fun, but it is interesting to note that all the Lisa users strongly agreed with this statement, and the Macintosh users agreed with it more than the IBM how much fun the Lisa users were having, and we heard the former group complaining-they were a little upset that their lot was to use the IBM instead of the Lisa.

6. It is easy to remember what each command does. The Macintosh users found it easy to remember the commands, whereas the Lisa and IBM users were fairly neutral. It is surprising that the Lisa and the Macintosh users were not in accord, because both systems use a similar icon-based command system. But the Lisa user were all secretaries and the Macintosh users were all faculty, and the Lisa word processing program is not as attractive as that of the Macintosh.

In addition to the questionnaires, we carried out interviews with the users. Here several differences among the computers emerged, differences that were difficult to capture in a questionnaire statement. As mentioned previously, all the users had had prior experience with a traditional Computer system. We thought that such experience would be an advantage when transferring to a new computer; and in particular, we expected that the users would find the IBM easier to use, since this system is more traditional, and more similar to the operating systems previously used. However, for the secretaries, the opposite was true: the IBM operating system was similar enough to their previous computer that they confused commands between the two, whereas the Apple operating systems were so completely different that there were no grounds for confusion. More importantly, the secretaries could see that the Apples had features not available on their previous computer and were easier to use, and thus could justify the work of switching.

We think this point is very important: to assure acceptance when switching to a new system, a significant advantage must be clear to the users. When switching from a typewriter to a computer the computer must be more than just a glorified typewriter that is difficult to learn; when switching to another computer, the new computer should have features that are better and easier to use than the old system, so that an investment of time in learning the new system is worthwhile.

## DIFFERENCES BETWEEN USER GROUPS

The six statements on our questionnaire that clarified differences between user groups were:

1. More classes would be useful for learning how to use the computer.

2. 1 don't know where to start.

3. 1 can't spare the time to learn about the new computer system.

4. My current workload is too heavy.

5. Frequent interruptions make it difficult to learn.

6. The computer is close enough to my desk.

The responses are charted it Table 2, and will be discussed here.

1. More classes would be useful for learning how to use the computer, The secretaries strongly agreed with this statement, while the faculty were fairly neutral. As we have seen, faculty disinterest was indicated by the fact that none of the faculty Macintosh users took advantage of the introductory class even though it was free. The faculty members seemed to be very comfortable learning box to use their computers by reading the manuals. They use reading to acquire information in other kinds of endeavors, so this seems to be a fairly natural way for them to learn. Also, reading the manuals to learn is fairly private. Since the faculty member-like the physician-has professional prestige which involves knowing hot to do things or knowing the answers to questions, failing in public rather than in private could be a very sensitive issue to this group. Apple's advertisements that their computers need no manuals

could actually be a hindrance in trying to sell machines to similar groups.

The secretaries, on the hand, were more comfortable being shown by others how the computers worked. In secretarial jobs, tasks are often learned through direct tutoring, usually by another secretary, so that information is passed verbally and through demonstration instead of through reading. If several secretaries are employed in one office, it may be useful to train one secretary, so he or she can tutor others.

2. 1 don't know where to start. Often the most difficult part of learning a new computer system is just getting started, and some of the secretaries indicated that this was a problem. If a difficulty occurs with the computer, it is sometimes tempting to blame the computer hardware or the set-up instead of trying to figure out what you did wrong yourself. To get around this problem, have the computer vendor set-up the computer in your office and check to make sure that it works. Otherwise, the user may think the computer worked during the class, at another site, but was not set. up properly in the office.

3 and 4.- I can't spare the time to learn about the new computer system. My current workload is too heavy. The secretaries strongly agreed that they did not have the time to learn the new computer systems, whereas the faculty members were neutral on these two statements. The secretaries have duties that cannot be rearranged easily while the faculty are more flexible and can find time-to work on a project like this, possibly in the evening or on weekends. Perhaps the next statement reveals on of the reasons why finding the time to learn may be a problem.

5. Frequent interruptions make it difficult to learn. The secretaries strongly agreed that interruptions interfered, while the faculty were again neutral. Secretaries have telephone calls that must be answered, people passing through the office for appointments, and requests from professional staff for work to be done. Finding a segment of time to master the computer is difficult. People usually learn better if they can concentrate on an activity for a period long enough to solve at least one particular problem. When a microcomputer is installed in an office, the secretary should

be given time off from regular duties to devote to the computer system. Although work hours may be lost initially, in the long run this policy will save time, and it will, certainly reduce secretary frustration. Interestingly, some of our secretaries came to work weekends and evenings, on their own time, just so that they could learn without interruptions.

6. The computer is close enough to my desk. The faculty strongly agreed with this statement, while some of the secretaries disagreed. Space and location problems are important issues, and rarely considered when buying a computer system. For example, if the phone is far away from the computer, then finding time to work on the computer is going to be difficult. More space may be required than is currently available at a secretary's desk, and office space may have to be rearranged to accommodate a computer. As an indication of the space needed, consider the dimensions of the three computers:

Lisa: 19"x 16" (computer and terminal) with 19'x7' keyboard plus mouse.

Macintosh: 10"11" (computer and terminal) with 13.5"x6" Keyboard plus mouse.

IBM: 19.6"x 16" (with the terminal on top of the computer), with 18 x 8" keyboard.

These dimensions do not include the printer (which is about the size of a typewriter) or the area on he desktop needed to move the mouse around. On the IBM, the mouse needs an area of 6"x5" to move around; the Apples are similar.

Information gleaned from the interviews showed that one of the main differences between secretaries and faculty was their estimate of the benefits of a word processor. Both were asked whether it would be faster to use a computer or a typewriter for long manuscripts, columns of numbers, a short paper, a short memo, and mathematical formulas. The faculty members almost always thought the computer would speed all categories of work.(47 of the 53... responses); the secretaries were more discerning, in that many of them thought a typewriter would be faster for some of the shorter tasks (24 of the 52 responses). Previous research [2] has indicated that word processing can be 50% slower than writing a letter in longhand. The secretaries seem to be more aware of the inefficiency implicit in the use of word processing for short tasks. When implementing a computer system, the employer must remember that some tasks should still be done the old way.

## CONCLUSIONS

The computers we considered offer a wide range of features at a reasonable cost. By comparing the computers-the IBM-XT, built to be flexible and powerful, and the Apples, designed for ease of use-we had a chance to compare different philosophies behind the design of the interface.

The IBM appealed mostly to the faculty members, who needed a machine that was powerful and flexible and were not put off by reading manuals to learn how to use it. The Lisa is also a relatively powerful machine which is easy and fun to learn. The secretaries who used this computer were all very impressed with it. The word about its ease of use quickly got around to the other secretaries, and they were all eager to try it. Unfortunately, the Lisa was not made available to faculty members. The Macintosh fared less well than the other two. It employed the same innovative design as the Lisa, but the small memory size and the single floppy-disk drive were very serious limitations. The configuration tested would not perform well in an office environment; the 128K version of the Macintosh is better suited to the home market. However, the 512K version should be well suited to an office environment, especially when it is supported by a hard disk.

When integrating a computer into an office environment care must be taken to ensure that its use is optimized. Keep in mind the following principles:

Secretaries learn better through individual tutoring. a Thoroughly training one secretary, to act as the resident expert, is better than training several secretaries at once.

The system vendor should set up the computer in the office where it wilt be used, to reassure the staff that it does work. a Your workplace may have to be changed to accommodate the new computer.

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Which computer should you buy? This is a complicated question, and the most intelligent answer will be based upon several considerations. It is vitally important to take into account he features of the computer and the characteristics of the users, and then try to find a good match.

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